

REMARKS

Amendments to Claims

Claim 1, the only independent claim, has been amended to claim the embodiment of the present invention wherein a plurality of the specifically defined separation trays are applied in a compact high-efficiency separation column as described in paragraphs [0054] and [0055] of Applicants' published patent application. In these paragraphs it is disclosed that the separation trays may be applied to produce a compact high-efficiency separation column and that the separation trays should be arranged vertically spaced apart.

Dependent claims 3-14 have been amended to reflect that the embodiment of the invention being claimed is the compact high-efficiency separation column, as recited in claim 1.

Dependent claim 14 has been further amended to claim the embodiment of the invention wherein the secondary gas outlet is arranged annularly around the primary gas outlet conduit. Support for this amendment is found in last three lines of paragraph [0041] of Applicants' published application and in Fig. 1, which shows secondary gas outlet 22 arranged annularly around primary gas outlet 20c.

New dependent claim 15 recites an important distinction between the centrifugal steam separator disclosed in the prior art and the separation trays employed in the compact separation column of the present invention, in that that are no blades or other means employed in Applicant's separation trays to restore linear flow to the primary gas as is the case in prior art centrifugal steam separator as discussed below. Support for new claim 15 is found in Paragraph [0039] and Figures 1 and 2 of Applicants' published application, which show swirl imparting means to impart rotational movement to the gas/liquid mixture, but do not show any downstream means to restore linear flow. While the limitation recited in claim 15 is a negative limitation, negative limitations are not inherently ambiguous or uncertain according to the courts so long as the boundaries of the patent protection sought are set forth definitely (MPEP 2175.05 (i)). New claim 15 is believed to meet this requirement.

New dependent claims 16-18 claim specific processes for which the compact high-efficiency separation columns of the invention are especially suited. Support for the new claims is found in paragraph [0056] of Applicants' published application wherein it is disclosed the compact high-efficiency separation column in accordance with the present invention can be

advantageously used for high pressure gas/liquid separations, such the separation of gas from condensate, or gas from water, in the production of natural gas from underground gas reservoirs. Pressures of 50 bar or higher are specifically disclosed in paragraph [0056] of Applicants' published application.

Claim Rejections - 35 U.S.C. § 103

Amended Claims 1 and 3-18 are Patentable over DE 38 32 420 (Artemov)

In the Office Action mailed December 21, 2009, the Examiner rejected claims 1 and 5 under 35 U.S.C. § 103(a) as being unpatentable over DE 38 32 420 (Artemov). To the extent the rejection applies to the claims as amended, Applicant respectfully traverses the rejection.

Artemov concerns a centrifugal steam separator for separating liquid water out of wet steam from a turbine to produce dry stream. While some of the parts of the centrifugal steam separator disclosed in Artemov are similar to parts of the separation trays employed in Applicant's compact high-efficiency separation column, there are a number of important distinctions between the centrifugal steam separator of Artemov and the compact high-efficiency separation column claimed in the amended claims.

For example, Artemov does not teach use of a plurality of vertically spaced apart separation trays in a compact high-efficiency separation column. Also, Artemov teaches the use of blades 12 in downstream-narrower tubes 9, to change the rotational movement of the steam flowing through tube 9 into a linear flow (See the discussion of Fig. 1 at the bottom of the third page of the English translation of Artemov). In Applicant's compact separation column the rotational movement of the primary gas caused by the swirl vanes is not changed into linear flow using blades or any other means. The absence of means to restore linear flow to the primary gas in the claimed compact separation column is recited as a limitation in new claim 15.

Moreover, it is noted that in the centrifugal steam separator of Artemov there is considerable distance between cap 14 (the means for removing and guiding the liquid-enriched fluid) and upper tube floor 7. (This distance is apparently needed for the change of the rotational movement of the steam into a linear flow.) In marked contrast, in Applicant's compact high-efficiency separation column the means for removing and guiding liquid-enriched fluid is arranged adjacent to (i.e., near or close to) upper plate 4.

On page 6 of the subject Office action is noted that the term “adjacent to” was not specifically defined in the present specification. This is true. However, it is respectfully submitted that it is not necessary to define in the specification every term used in a claim, especially when the claim term is used for its common ordinary meaning. “Adjacent” is generally defined in dictionaries to mean “near or close to”. This is the meaning of the term “adjacent” in the present claims. In both Figs. 1 and 2 the means for removing and guiding liquid enriched fluid is located near or close to the upper plate (The upper plate is designated 4 in Fig. 1 and 110 in Fig. 2). This is not true of the means for removing and guiding the liquid-enriched fluid in Artemov, which is separated from upper tube floor 7 by a considerable distance (i.e., the height of narrower tube 9), as discussed above.

The relatively short distance between the upper plate and the means to remove and guide the liquid-enriched fluid is important, if not critical, to achieving a compact high efficiency separation column containing a plurality of separation trays as presently claimed. It is respectfully submitted that the currently claimed compact high-efficiency separation column containing multiple vertically spaced apart separations trays having means for removing and guiding liquid-enriched fluid adjacent to the upper plate is not taught or reasonably suggested by Artemov, alone or in combination with the other cited references.

For at least these reasons, amended claims 1 and 5, and all of the claims which directly or indirectly depend thereon, are believed to be patentable over Artemov.

Amended claim 14 is believed to be patentable over Artemov for the additional reason that neither Artemov nor any of the other cited references, teach or reasonably suggest a compact high-efficiency separation column having a secondary gas outlet arranged annularly around the primary gas outlet conduit.

New claim 15 is believed to be patentable over Artemov in that Artemov clearly teaches the use of blades 12 or other means in narrower tube 9 to change the rotational movement of the steam (the primary gas) into a linear flow. The presently claimed compact high-efficiency separation column contains no such means for changing the rotational movement of the primary gas to linear flow.

New claims 16-18 are believed to be patentable over Artemov in that Artemov is concerned with the separation of water from wet steam to produce dry steam using a centrifugal steam separator. In marked contrast, new claims 16-18 are directed to totally different processes

involving the separation of natural gas from condensates or from water at high pressures (e.g., pressures of 50 bar or higher) in the production of natural gas from underground gas reservoirs. Applicant respectfully submits the processes recited in new claims 16-18 are not taught or reasonably suggested by Artemov or any of the other cited references.

Amended Claims 3, 4 and 6-8 are Patentable over DE 38 32 420 (Artemov) in View of EPO 0 048 508 (Schuurmans)

In the Office Action mailed December 21, 2009, the Examiner rejected claims 3, 4 and 6-8 under 35 U.S.C. §103(a) as being unpatentable over DE 38 32 420 (Artemov) in view of EPO 0 048 508 (Schuurmans). To the extent the rejection applies to the claims as amended, Applicant respectfully traverses the rejection.

Schuurmans is cited for its teaching of a primary separation device having a tubular conduit wherein at least one opening (67) is formed in the sidewall thereof. Applicant acknowledges that Schuurmans does indeed teach a tubular conduit having openings in the sidewalls of the tubular conduit. However, Applicant believes the conclusion stated on page 4 of the subject Office action, that this would make it obvious to modify Artemov to include at least one opening in the sidewall of the tubular conduit 8 “in order to reduce the pressure drop in the primary separation device by allowing more exit areas for the liquid enriched fluid from the tubular conduit”, is untenable. Artemov very clearly teaches that the water separated by centrifugal forces “settles on the inside of tubes 8 and is separated and is carried away via the gap 10 with a portion of the steam into the separation chamber 3”. Thus, if one skilled in the art wanted to reduce the pressure drop in the primary separation device, they simply would increase the size of “gap 10”. They would not be motivated to place openings in the sidewalls 8 since this would interfere with the settling of water on the inside of the tubes 8, which Artemov teaches is desirable in achieving separation of the water from steam.

On page 4 of the subject Office action it is stated that the Schuurmans reference “also teaches forming the return skirt (72) around the tubular conduit as being integral with the upper wall of the separation tray”. It is respectfully pointed out that skirt 72 in Schuurmans is not a “return” skirt. The Examiner’s attention is directed to the sentence bridging pages 9 and 10 of Schuurmans where the function of skirt 72 is described. It is disclosed that: “In order to prevent that liquid discharged from a separation chamber 63 will hamper the liquid discharge from an

adjacent separating chamber 63, skirts 72 are arranged between adjacent chambers 63”. Thus, skirts 72 function to prevent liquid from splashing on adjacent separation chambers. They are not “return” skirts for directing the flow of liquid-enriched secondary gas into inner space between the swirl tubes (apparatus 61). In fact many of swirl tubes 61 and separation chambers 63 in Fig. 7 of Schuurmans do not have skirts on all sides. Hence, Schuurmans does not suggest modifying the centrifugal steam separator taught in Artemov by forming the return skirt (cap 14 in Artemov) with upper tube floor 7. In order to move cap 14 up to upper tube floor 7 one would have to eliminate narrower tube 9 and blades 12, which Artemov teaches are needed to change the rotational movement of the steam to linear flow.

Amended Claims 9-14 are Patentable over DE 38 32 420 (Artemov) in View of EPO 0 048 508 (Schuurmans) and Further in View of US 5,626,799 (Sheinman)

In the Office action mailed December 21, 2009, the Examiner rejected claims 9-14 under 35 U.S.C. §103(a) as being unpatentable over the reference combination as applied to claims 3, 4 and 6-8 above, and further in view of U.S. Patent No. 5,626,799 (Sheinman). To the extent the rejection applies to the claims as amended, Applicant respectfully traverses the rejection.

Sheinman relates to equipment used in heat-mass exchange systems for contacting gas and liquids rather than separating gas and liquid, which is the purpose of the apparatus in Artemov and Schuurmans. Apparently Sheinman is being cited for its teaching that a swirl imparting structure can be formed integrally with a bottom plate of a separator by way of a stamping process. Applicant does not necessarily agree that “stamping process” inherently performs a slitting step immediately followed by a bending step to provide a swirl vane structure as stated in the subject Office action. However, Applicant is not relying for the manner of manufacturing the swirl imparting means for the patentability of claims 9-12, or the arrangement of separation devices in claim 13 for patentability of claim 13. Claims 9-13, which are indirectly dependent on claim 1, are believed to be patentable for the same reasons discussed above in connection with amended claim 1. The cited references do not teach or reasonably suggest a compact high-efficiency separation column having a plurality of vertically spaced apart separation trays in which the means for removing and guiding liquid-enriched fluid is arranged to receive all of the liquid-enriched fluid at a position adjacent to the normally horizontal upper wall.

Amended claim 14 is believed to be patentable over a combination of Artemov, Schuurmans and Sheinman for the additional reason that none of these references teach or reasonably suggest a compact high-efficiency separation column having a secondary gas outlet arranged annularly around the primary gas outlet conduit.

New claims 16-18 are believed to be patentable over a combination of Artemov, Schuurmans and Sheinman, in that none of these references teach or reasonably suggest a process for separating natural gas from condensates or from water at high pressures (e.g., pressures of 50 bar or higher) in the production of natural gas from underground gas reservoirs using a compact high-efficiency separation column.

Conclusion

For all of the above reasons, claims 1 and 2-14, as amended, and new claims 15-18, are believed to be patentable over the cited references. Accordingly, reconsideration and early allowance of the application is respectfully requested.

Respectfully submitted,

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